Volcanism

Lesson Plans

- Use with the **Volcanism** module.
- Use with the **Volcanism** worksheets.
- Appropriate for grades **4** and higher.

Table of Contents

The Big Idea (or Central Theme)

What is the overall concept that we would like students to understand after exploring this module?

Earth and Space Science

- Landforms are the result of a combination of constructive and destructive forces.
- Some changes in the solid earth can be described as the "rock cycle."
- Major geological events are the result of lithospheric plate motions.

Essential Questions

What questions will encourage student inquiry?

1. Is a volcanic eruption constructive or destructive? Why do you think so?

2. Does destruction have to take place before or along with creation?

3. How has volcanism affected the earth's history? How do you think it will affect the earth's future?

Assessment

What evidence is there that students have achieved understanding of the Big Idea?

♦ **Performance Tasks / Projects**

1. Students will summarize the formation of a volcano in the form of a flow chart.

2. Students will illustrate or demonstrate, using media of their choice, how a landform or feature of their choice can be created by volcanism. (Examples of media might include a poster, diorama, power point presentation, comic strip, etc.)

3. Students will design and build a device that will detect either changes in temperature or movements in a surface.

♦ **Quizzes / Tests**

1. Vocabulary quiz, if desired.

♦ **Prompts**

1. In groups, students will create a news magazine devoted to the eruption of a volcano.

2. Students will write a letter to the editor of the fictional "Mountainside Times." Explain why the new school should not be built in the shadow of Mount Blowsitstop, a volcano in the area.

♦ **Observation Data**

1. Observation data will be collected during class discussions and during work on the performance tasks and projects.

♦ **Self-assessments**

1. Students will self-assess their performance tasks, projects, and prompts.

Planning Lessons

Lessons should take teachers and students step-by-step through the modules. There will be several lessons per module.

Lesson One: Introduction to Volcanism
Lesson Two: Eruptions
Lesson Three: Landforms and Features
Lesson Four: Monitoring and Parks

Introduction to Volcanism

Curriculum Standards

- National Science Education Standards
  - Science as Inquiry
  - Earth Science
  - Science and Technology

- Standards for the English Language Arts:
  - #1 – Students read a wide range of texts…

- National Council for the Social Studies Curriculum Standards
  - People, Places and Environments
  - Science, Technology and Society

Objectives

Students Will Be Able To describe features and types of volcanoes.

SWBAT compare three types of volcanoes.

Students will be able to describe how a volcano forms, in sequence.

Inquiry Questions

1. What is a volcano?
2. How are volcanoes formed?
3. What effects have volcanoes had on our Earth?
4. What effects will volcanoes have on our Earth in the future?

Materials

- *Views of the National Parks* CD
- Volcanism Outline
- Volcanism Game Cards
- Formation Flowchart Worksheet
- Construction paper

Procedure (Part One)

1. If students have not had a chance to explore the *Views* CD, allow them some time to explore on their own or in small groups.
2. After students have looked at the disc in general, ask them to find and explore the Volcanism Knowledge Center. (At the Visitor Center, click on "Knowledge Centers," then on the "Volcanism."
3. Consider doing a vocabulary lesson around the word "Volcano." See the Vocabulary Lesson Plan in the Teacher Resource Center of *Views*.
4. Individually or in small groups, ask students to complete the Volcanism Outline using the information found in the "Introduction" section of the Volcanism Knowledge Center.

Procedure (Part Two - Vocabulary Games)

1. Following are several games to choose from designed to help students learn the vocabulary and key concepts that are found in this introduction section.

Game One – "Roam the Room"

1. Copy the Volcanism Game Cards on to card stock and cut them apart.
2. Give each student one card.
3. Explain that each student holds either a volcanism vocabulary word, or a definition that goes along with one of the vocabulary words.
4. Ask students to "roam the room," looking for the person who holds the card that goes along with theirs.
5. Repeat this process several times so that students have the opportunity to work with several different terms.

Game Two – "Group Sort"

1. Copy the Volcanism Game Cards on to card stock and cut them apart. (You'll need one set per group.)
2. Place the students in heterogeneous groups of three or four.
3. Ask students to sort the cards, matching each term with its definition.
4. Encourage students to take turns sharing ideas, so that everyone is participating.

Game Three – "Memory"

1. Copy the Volcanism Game Cards on to card stock and cut them apart. (You'll need one set per group.)
2. Place the students in heterogeneous groups of three or four.
3. Ask the students to shuffle the cards, then lay them out on a desk, face down.
4. Taking turns, students should each turn over two cards, looking for a vocabulary word and its matching definition.
5. If no match, turn both cards back over. End of turn.
6. If a match is found, the student keeps the cards, and takes another turn.
7. Continue until all matches have been found.

Procedure (Part Three - Volcano Formation)

1. After students have completed the outline and played one or more of the vocabulary games, discuss the following questions:

- What is a volcano?
- What purpose does a volcano serve?
- How are the four types of volcanoes different from each other?
- How are they similar?
- What are the three places a volcano can form?
- How can magma differ?
- How do those differences affect eruptions and the rock that forms from the magma?

2. From the Introduction page of the Volcanism Knowledge Center, ask students to click on "Types of Volcanoes."

3. Pairs of students should choose or be assigned one of the four types of volcanoes to study.

4. Ask students to summarize the formation of their chosen type of volcano in the form of a flow chart, using the Formation Flowchart Worksheet. (You may need to make some extra copies of the flowchart shapes, as some of the volcanoes have more steps to their formation than others.) Students should glue their flowcharts on construction paper.

Key Vocabulary

- Volcano
- Cinder Cone
- Composite Volcano
- Shield Volcano
- Lava Dome
- Hot Spots
- Spreading Centers
- Subduction
- Magma
- Mafic Magma
- Intermediate Magma
- Felsic Magma
- Igneous Rocks
- Extrusive Igneous Rocks
- Intrusive Igneous Rocks

Discussion Questions

1. What is a volcano?
2. What purpose does a volcano serve?
3. How are the four types of volcanoes different from each other?
4. How are they similar?
5. What are the three places a volcano can form?
6. How can magma differ?
7. How do those differences affect eruptions and the rock that forms from the magma?

Assessment

Students Will Be Assessed On ...

1. Completed Volcanism Outline and Formation Flowchart.

2. Participation in classroom activities and discussions.

Differentiation

To best meet all students' needs, we suggest ...

1. Providing sentence starters or fill-in-the-blank sentences on the Volcanism Outline and Formation Flowchart.

2. Heterogeneous grouping/pairing for the vocabulary games and Flowchart activity.

Eruptions

Curriculum Standards

- National Science Education Standards
  - Science as Inquiry
  - Earth Science
  - Science and Technology

- Standards for the English Language Arts
  - #1 – Students read a wide range of texts…
  - #4 – Students will adjust their use of written language…

- National Council for the Social Studies Curriculum Standards
  - People, Places and Environments
  - Science, Technology and Society

Objectives

Students Will Be Able To compare and contrast effusive and explosive volcanic eruptions.

SWBAT explain the hazards of volcanic eruptions.

SWBAT apply knowledge of the hazards of volcanic eruptions to write a persuasive letter.

Inquiry Questions

1. Does every volcano erupt in the same way?

2. Do different types of volcanic eruptions have different effects on the Earth?

3. What are the hazards of a volcanic eruption?

Materials

- *Views of the National Parks* CD
- Eruptions KWL
- Eruptions Venn Diagram
- Sample letters to the editor of a local newspaper
- Letter to the Editor Rubric
- Copies of news magazines such as Jr. Scholastic, Time for Kids, etc.
- Self-assessment Questions

Procedure (Part One - Introduction to Eruptions)

1. Before exploring the "Eruptions" section of the Volcanism Knowledge Center, ask students to complete the "K" column on the Eruptions KWL. Students should list what they already "Know" about volcanic eruptions.

2. Ask students to brainstorm what they "Want to Learn" about volcanic eruptions. These ideas should be written in the "W" section of the Eruptions KWL.

3. Ask students to explore the "Eruptions" section of the Volcanism Knowledge Center.

4. Individually or in pairs, ask students to complete the Eruptions Venn Diagram, comparing and contrasting Effusive and Explosive eruptions.

Procedure (Part Two - Letters to the Editor)

1. Direct students' attention to the "Hazards" page of the Eruptions section.

2. Allow students an opportunity to explore the eight different hazards described on the CD. Model and encourage note-taking.

3. Show students examples of letters to the editor of a local newspaper.

4. Ask: What is the purpose of these letters? What makes them effective in achieving this purpose?

5. Assign the writing prompt: Write a letter to the editor of the fictional "Mountainside Times." Explain why a new school should not be built in the shadow of Mount Blowsitstop, a volcano in the area. Letters should contain at least five reasons why this might not be the best location for a school. (Students can include more or fewer reasons, based on ability.)

6. Ask: What did you learn about the hazards of volcanic eruptions that would support your stance against building the new school near the volcano?

7. Distribute copies of the Letter to the Editor Rubric. Ask students to self-assess their work before turning it in for your assessment.

Procedure (Part Three - Recent Times Ecosystem)

1. Divide the students into heterogeneous groups of three or four.

2. Distribute copies of news magazines for groups to look over.

3. Ask the following discussion questions:

- What is the purpose of this type of magazine?
- What do you notice about the format of the magazine?
- The articles?
- What do you notice about the photographs and other illustrations, such as charts and graphs?

4. Ask groups to research the eruption of a volcano of their choice (you may want to provide some examples to choose from, many are listed on the *Views* CD), and create a news magazine about that eruption, similar to the examples.

5. Each magazine should include a cover, at least two articles (suggest one describing the actual eruption and one describing the effects of the eruption), and at least one illustration (drawing, graph, or other illustration).
6. Distribute copies of the Self-assessment Questions. Each student (not each group) should complete a reflection sheet to be turned in with the magazine.

Procedure (Part Four - Eruptions KWL)
1. Students should complete the final column of the Eruptions KWL, filling in what they "Learned" in the "L" section.

Key Vocabulary

- Effusive Eruption
- Explosive Eruption
- Lava
- Volatile
- Tephra
- Lahar
- Pyroclastic Flow
- Ashfall
- Blow-down
- Tsunami
- Volcanic Gasses

Discussion Questions

1. What is the purpose of these letters to the editor?

2. What makes them effective in achieving this purpose?

3. What did you learn about the hazards of volcanic eruptions that would support your stance against building a new school near a volcano?

4. What is the purpose of this type of magazine?

5. What do you notice about the format of the magazine? The articles?

6. What do you notice about the photographs and other illustrations, such as charts and graphs?

Assessment

Students Will Be Assessed On ...

1. Participation in classroom activities and discussions.

2. Completed Venn Diagram, Letter to the Editor, and News Magazine.

Differentiation

To best meet all students' needs, we suggest ...

1. Providing sentence starters or fill-in-the-blank sentences on the Venn Diagram and Letter to the Editor.

2. Increasing or reducing the required length of the letter to the editor.

3. Heterogeneous grouping for the News Magazine activity.

Landforms and Features

Curriculum Standards

- National Science Education Standards
  - Science as Inquiry
  - Earth Science
  - Science and Technology

- Standards for the English Language Arts
  - #1 – Students read a wide range of texts…
  - #4 – Students will adjust their use of written language…

- National Council for the Social Studies Curriculum Standards
  - People, Places and Environments
  - Science, Technology and Society

Objectives

Students Will Be Able To explain how different landforms and features are created by volcanism.

SWBAT illustrate how a particular landform or feature can be created by volcanism.

Inquiry Questions

1. Is a volcanic eruption constructive or destructive?

2. Why do you think so?

3. Does destruction have to take place before or along with construction?

Materials

- *Views of the National Parks* CD
- Features Jigsaw Worksheet
- Features Note-Taking Sheet
- Project Self-Assessment Sheet

Procedure (Part One - Jigsaw)

1. Allow students to explore the "Features" section of the Volcanism Knowledge Center.

2. Divide the class into eight heterogeneous groups. Assign each group one of the landforms or features described.

3. Each group should read the information about their assigned feature, completing the Features Jigsaw Worksheet as they go.

4. Groups should then plan how they will share what they learned with the class, making sure that each member of the group has an opportunity to participate.

5. Allow each group an opportunity to share what they learned. As groups share, the rest of the students should take notes on the Features Note-Taking Sheet. (There are only seven sections on this sheet because groups will not be taking notes on the feature they are presenting.)

6. Discuss these questions: Do you think volcanoes are more creative or destructive? Why do you think so? Do you think destruction has to take place before or along with creation? Why or why not? How has volcanism changed our earth? How do you think volcanism might change our earth in the future?

Procedure (Part Two - Project)

1. Review the different features and landforms students learned about during the Jigsaw activity.

2. Assign the project: Students should illustrate or demonstrate, using the media of their choice, a landform or feature that can be created by volcanism.

3. Brainstorm types of media. Examples might include a poster, diorama, comic strip, power point presentation, etc. Encourage students to be creative.

4. Distribute copies of the Project Self-Assessment Sheet. Tell students that this sheet is due along with their projects.

Key Vocabulary

- Caldera
- Crater
- Fumarole
- Geothermal
- Igneous
- Lava
- Magma
- Lava Tube
- Diatreme
- Maar
- Tectonic
- Subsidence
- Geyser
- Summit
- Flank
- Pyroclastic
- Fissures
- Molten
- Acidic
- Conduit
- Topography
- Viscosity

Discussion Questions

1. Do you think volcanoes are more constructive or destructive? Why do you think so?

2. Do you think destruction has to take place before or along with construction? Why or why not?

3. How has volcanism changed our Earth?

4. How do you think volcanism might change our Earth in the future?

Assessment

Students Will Be Assessed On ...

1. Participation in classroom activities and discussions.

2. Completed Jigsaw Worksheet, Note-Taking Worksheet, Project, and Self-Assessment Worksheet.

Differentiation

To best meet all students' needs, we suggest ...

1. Assigning a more able student as "scribe" for the Features Jigsaw Worksheet.

2. Providing sentence starters or fill-in-the-blank sentences on the Note Taking Worksheet.

3. Heterogeneous grouping for the Jigsaw activity.

Monitoring and Parks

Curriculum Standards

- National Science Education Standards
  - Science as Inquiry
  - Earth Science
  - Science and Technology

- Standards for the English Language Arts
  - #1 – Students read a wide range of texts…
  - #4 – Students will adjust their use of written language…

- National Council for the Social Studies Curriculum Standards
  - People, Places and Environments
  - Science, Technology and Society

Objectives

Students Will Be Able To explain the importance of monitoring of volcanic areas.

SWBAT apply their knowledge to the design of a monitoring device.

SWBAT predict how volcanism might change our Earth in the future.

Inquiry Questions

1. Why is it important for scientists to monitor volcanoes?
2. How do scientists monitor volcanoes? What technology is used?
3. How has our Earth changed over time?
4. How might our Earth change in the future?

Materials

- *Views of the National Parks* CD
- Monitoring Graphic Organizer
- Past, Present, and Future Worksheet

Procedure (Part One - Monitoring)

1. Ask: What kind of things do scientists monitor? Remind students that doctors are scientists. What does the doctor monitor when you are sick or in for a physical? Why does the doctor monitor these things? What tools does he or she use?

2. Encourage students to explore the "Monitoring" section of the Views CD, completing the Monitoring Graphic Organizer as they explore. (This sheet can be completed individually or in pairs/small groups.)

3. Ask: How is the monitoring of volcanic areas similar to the monitoring a doctor does? Why do scientists monitor volcanic areas? What tools do they use?

Procedure (Part Two - Project)

1. The tools described on the *Views* CD are quite "high-tech." As a large group, brainstorm "low-tech" ways to monitor changes in temperature and movement of a surface.

2. Divide the class into heterogeneous pairs or small groups.

3. Assign the project: Design and build a "low-tech" device that will detect either changes in temperature or movements in a surface.

4. Tell students that along with the device, each group should turn in step-by-step directions for the building and use of their device. Students will be graded on both their device and on the written directions.

Procedure (Part Three - Parks)

1. This section of the *Views* CD consists of links to case studies of various National Parks. The landscape at each of the parks listed has, at least in part, been formed by volcanic activity.

2. Encourage students to explore the "Parks" section of the *Views* CD. Students can click on either the name of the park listed to the right, or the location of the park on the map to the left, to be linked to the case study of that park.

3. Ask students to choose a case study of a park, and use that case study to complete the Past, Present, and Future Worksheet.

4. Discuss how past volcanic activity, as well as present-day monitoring tools, can be used to predict future changes to the landscape.

Key Vocabulary

- Volcanologist
- Emissions
- Geomorphology
- Seismology

Discussion Questions

1. What kind of things do scientists monitor?

2. What does the doctor monitor when you are sick or in for a physical?

3. Why does the doctor monitor these things?

4. What tools does he or she use?

5. How is the monitoring of volcanic areas similar to the monitoring a doctor does?

6. Why do scientists monitor volcanic areas?

7. What tools do they use?

8. How can past volcanic activity, as well as present-day monitoring tools be used to predict future changes to the landscape?

Assessment

Students Will Be Assessed On ...

1. Participation in classroom activities and discussions.

2. Completed Graphic Organizer, Monitoring Device, and Past, Present and Future Worksheet.

Differentiation

To best meet all students' needs, we suggest ...

1. Providing sentence starters or fill-in-the-blank sentences on the Graphic Organizer and Past, Present and Future Worksheet.

2. Heterogeneous grouping for the "Device" project.

Additional Enrichment Activities

The following activities are designed as extensions of the above lessons. These activities can also be found on the Volcanism Tic-Tac-Toe worksheet. Pick and choose your favorite activities or allow students to choose – Use these activities in the way that works best for you.

- Create a model of a volcano, or demonstration of a volcanic eruption. (Suggestions/directions are readily available online. Try searching "volcano experiments.")

- Write a children's book about volcanoes (8-10 pages.) Decide what important facts you want your book to teach. Use appropriate vocabulary and lots of illustrations!

- Write a letter to a friend, describing a real or imaginary volcanic eruption you've "witnessed."

- Write a script for a newscast about a real or imaginary volcanic eruption. Include specific details of the effects of the eruption on the landscape and people in the area. If possible, film yourself or a friend reading your script!

- Research the career of "Volcanologist." Create a brochure describing what the job entails, as well as what education is required. Your brochure should persuade the reader to become a volcanologist.

- Use at least 20 vocabulary words from the Volcanism Knowledge Center to create a crossword puzzle.

- Create an art project inspired by what you've learned about volcanoes. Consider a painting, sculpture, poem, song, dance, or any other form of art.

- Research an actual volcanic eruption. Write a 3-5 paragraph newspaper article describing the eruption and its effects on the landscape and people in the area.

- Draw a physical map of a continent or country (other than the United States.) Include at least 3 areas of volcanic activity.